# A NEW SIPHONOSTOMATOID COPEPOD ASSOCIATED WITH THE WEST INDIAN SEA URCHIN, *DIADEMA ANTILLARUM*

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ABSTRACT

The adult female and male of *Onychocheres alatus* new genus, new species (Copepoda Siphonostomatoidea, family Asterocheridae) are described. These and the later copepodites (at least the stages IV and V) live on the spines (and in the interspinal space) of the tropical shallow-water echinoid, *Diadema antillarum* Philippi. Although the host is widely distributed in the Atlantic, the copepod appears to be restricted to the mid- and western Caribbean Sea and the Gulf of Mexico. It is probably host-specific, since it was not found on other sea urchins in the same biotope.

*Diadema antillarum* Philippi, 1845, the black long-spined sea urchin, is a common and ecologically important species in the tropical Atlantic (Sammarco, 1980; 1982), found between Bermuda and Brazil in the west, and Madeira to the Gulf of Guinea in the east, littoral to 200 fathoms.

Most populations in the western Atlantic suffered mass mortalities in 1983 (Lessios et al., 1983; Bak et al., 1984), presumably resulting from the effect of some disease organism. The outbreak was first noted near the Panama Canal in January 1983 and spread rapidly over the entire West Indian region. During fieldwork by the senior author in Curaçao and Bonaire in May 1984, hardly any recovery was noted.

The cause of the epidemic is unknown, and although the copepod associate described in this paper swims actively and is capable of leaving its host, it is unlikely that it plays a role as a vector to transmit the pathogens, since the distribution of the copepod and of the epidemic do not coincide.

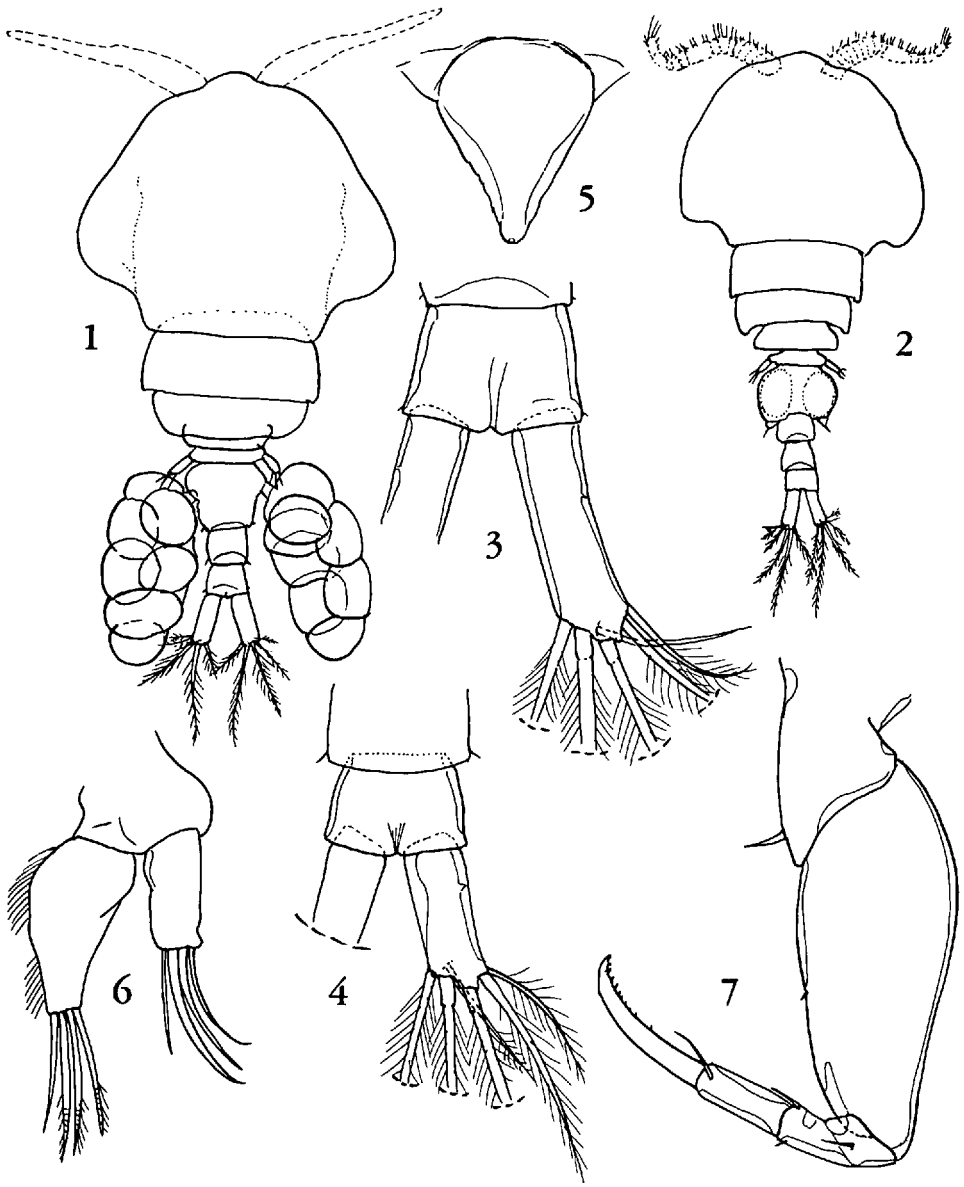
## ***Onychocheres*** new genus

*Diagnosis.*—Family Asterocheridae Giesbrecht, 1899. Near *Asterocheres* Boeck, 1859 (=*Ascomyzon* Thorell, 1859, and including *Echinocheres* Claus, 1889), except for: cephalosome (♀, ♂) laterally expanded, much wider than metasomites 1 and 2 (vs. cephalosome regularly rounded, about as wide as the anterior metasomites); first antenna 18- (♀) or 14- (♂) segmented, aesthete on terminal segment (vs. 18- to 21- (♀) or 17- to 18- (♂) segmented, aesthete on penultimate or antepenultimate segment); second antenna (♀, ♂) distally armed with a strong, curved claw (vs. a slender, almost setiform, feebly curved element); mandible palp (♀, ♂) short, 1-segmented, distally armed with 2 heavy, long, plumose setae of equal size (vs. palp slender, 1- or 2-segmented, distally with 2 very unequal, thin setae); distal exopodite segment of leg 1 (♀, ♂) with 2 lateral spines (vs. 3 spines); second endopodite segment of leg 1 (♀, ♂) with 1 medial seta (vs. 2 setae).

*Type-species.*—*Onychocheres alatus* new species.

*Host.*—The type-species is at present known only from association with a regular sea urchin belonging to the genus *Diadema.*

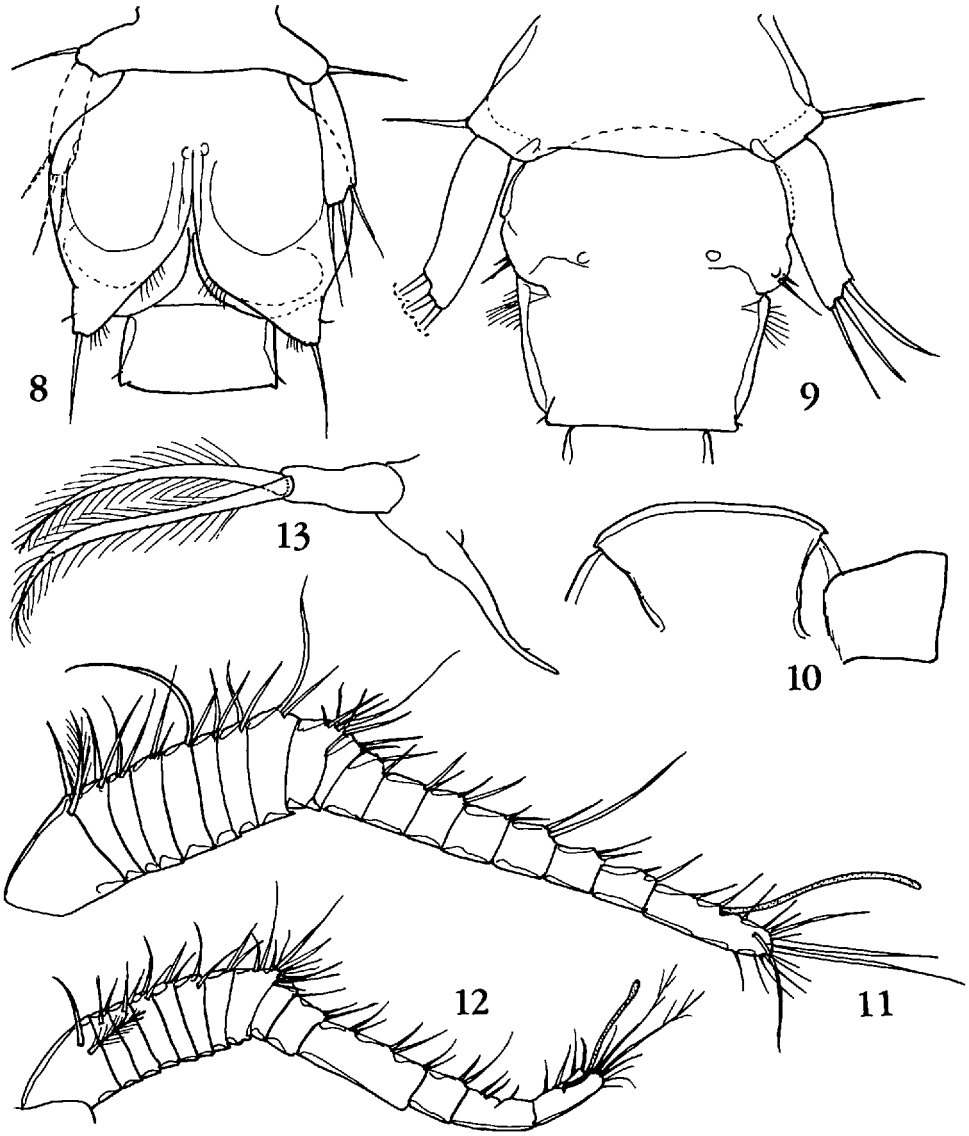
*Etymology.*—The generic name is composed of the second half of the name




Figures 1–7. *Onychocheres alatus* new genus, new species. 1, Female, dorsal (scale AB); 2, ♂, dorsal (AB); 3, anal somite and furca, ♀, ventral (AD); 4, anal somite and furca, ♂, ventral (AD); 5, proboscis, ♀, ventral (AC); 6, first maxilla, ♀ (AE); 7, maxilliped, ♀ (AD). Each scale represents 100 μm. Scales on last figure.

*Asterocheres* (ἀκαιρος = awkward) and *ονυξ* = claw, alluding to the strongly prehensile nature of the second antenna. The specific name *alatus* (Latin = winged) refers to the lateral "wings" of the cephalosome.

*Remarks.*—The morphology of the dozens of species of *Asterocheres* described so far is very uniform. The present species deviates so considerably from these that the creation of a new genus seems fully justified.




Figures. 8–13. *Onychocheres alatus* new genus, new species. 8, Genital somite and fifth leg, ♂, ventral (scale AD); 9, genital somite and fifth leg, ♀, ventral (AD); 10, rostral fold, ♀, ventral (AD); 11, first antenna, ♀ (AD); 12, first antenna, ♂ (AD); 13, mandible,♀ (AD). Each scale represents 100 μm. Scales on last figure.

## ***Onychocheres alatus*** new species

*Synonymy.*—*Asterocheres* n. sp., Gooding, 1974: 335.

*Material examined.*—One ♀ (holotype), 1 ♂ (allotype), 20 ♀♀ and 18 ♂♂ (paratypes). From 25 *Diadema antillarum.* Curaçao, Santa Martha Inner Bay, behind the fieldstation of the Natural History Society; on coral rubble at a depth of ca. 0.3 m; 25 January 1958 (Zoölogisch Museum, Amsterdam: ZMA Co. 102.702).

Two ♀♀, 3 ♂♂. From 40 *Diadema antillarum.* Curaçao, Piscadera Bay, in front of Caribbean Marine Biological Institute; on coral rubble, depth ca. 1 m; 26 September 1958 (ZMA Co. 102.704).

Ten ♀♀, 10 ♂♂. From 60 *D. antillarum.* Same locality, depth ca. 0.5 m; 15 November 1973 (ZMA Co. 102.703).

*Description.*—Measurements (6 specimens of either sex). Length body (frontal margin cephalosome to tip furca): ♂♂ 775–812 μm (mean 788 μm), ♀♀ 933–1,010 μm (mean 974 μm). Greatest width cephalosome: ♂♂ 424–464 μm (mean 439 μm), ♀♀ 516–579 μm (mean 567 μm).

*Female.*—Cephalosome with wing-like expansion on either side (Fig. 1); only posterior part of cephalosome having "normal" width, i.e., about as wide as next two body somites. Third metasomite much narrower than second, first urosomite hardly narrower than last metasomite. Genital somite of shape usual in *Asterocheres* (Fig. 9), carrying 2 spinules in front of genital apertures, and a row of cilia caudad of it. Ovisacs (Fig. 1) elongate ovate, containing low number of large eggs. Two post-genital somites, both virtually unarmed. Caudal ramus 106 × 32 μm, with 4 strong, plumose distal setae, 1 finer, lateral, subdistal, plumose seta, and 1 thin, dorsal, subdistal, plumose seta (Fig. 3).

First antennae separated in midline by slightly rounded rostral fold (Fig. 10). Each antenna 18-segmented (Fig. 11), all—except segments 1 and 18—short. Segment 1 with 1 plumose seta; all other setae naked. Aesthete implanted slightly beyond middle of segment 18.

Second antenna (Fig. 14) with 2 basipodal segments, both unarmed, 2nd very robust. Exopodite 1-segmented, short, armed with 3 setae. Endopodite segment 1 longer than basipodite segment 2, armed with row of lateral cilia only. Endopodite segments 2 and 3 imperfectly articulated, segment 3 armed with spinule and setule; distal claw strongly curved, heavy.

Proboscis (Fig. 5) short, conical, without tubular distal portion.

Mandible stylet slightly sinuous, short; palp short, 1-segmented, distally with 2 very long, heavy, plumose setae (Fig. 13).

First maxilla (Fig. 6) consisting of 2 lobes, each with 4 setae of equal length; inner lobe wider and slightly longer than outer.

Second maxilla (Fig. 15) with 2-segmented, unarmed basal portion and slender distal claw, the latter with 2 spinules near middle and a few minute spinules near tip. Claw may show up incurved or outcurved in various positions under coverglass pressure.

Maxilliped (Fig. 7): basal portion 2-segmented, segment 1 with 1 spine, segment 2 with minute spinule near middle of inner margin. Claw portion 4-segmented; segments 1 to 3 with 1, 2 and 1 spines, respectively. Segment 4 slightly curved, inner margin finely crenulated.

Legs 1 to 4 (Figs. 16, 18, 19, and 20) biramous, each ramus 3-segmented. Endopodite of leg 4 as long as exopodite. Intercoxal plates present in all legs. Chaetotaxis formula as follows (spines in roman numerals, setae in Arabic ones):

| | coxopodite | basipodite | exopodite | endopodite |
|---|---|---|---|---|
| P1 | 0-0 | 1-1 | I-1;I-1;II-2-2 | 0-1;0-1;1-2-3 |
| P2 | 0-0 | 1-0 | I-1;I-1;III-I-4 | 0-1;0-2;1-2-3 |
| P3 | 0-0 | 1-0 | I-1;I-1;III-I-4 | 0-1;0-2;1-1+I-3 |
| P4 | 0-0 | 1-0 | I-1;I-1;III-I-4 | 0-1;0-2;1-1+I-2 |

Fifth leg (Fig. 9) 1-segmented, 60 × 16 μm (greatest diameter). Above its implantation, first urosomite bearing lateral seta. Free segment with 3 (sub)distal setae.

*Male.*—Cephalosome with lateral expansions, as in female. Genital somite (Fig. 8) regularly rounded, posterior margins projecting into "genital lobes" (=6th legs),

each with 1 longer and 1 shorter seta. Three post-genital somites. Furca less elongate than in ♀, 73 × 27 μm.

First antenna geniculate (Fig. 12). Segments 1 to 7 as in ♀, segment 8 homologous with 8 + 9 (♀); segments 9 and 10 homologous with 10 and 11 (♀); segment 11 very elongate and homologous with 12 + 13 + 14 (♀); segment 12 short, corresponding with 15 (♀); segment 13 elongate and representing 16 + 17 (♀); segment 14 (=terminal) corresponds with 18 (♀) and bears 1 aesthete.

Second antenna, mouthparts, and maxilliped as in ♀.

First leg practically as in ♀; spiniform processes on distal endopodite segment slightly more pronounced.

Second and third legs sexually dimorphous in 3rd endopodite segment (Fig. 17): lateral seta shortened, spiniform processes more elongated, shape of entire segment more slender.

Fourth leg as in ♀. Chaetotaxis of all biramous legs as in ♀.

Fifth leg (Fig. 8) 48 × 14 μm; armature as in ♀.

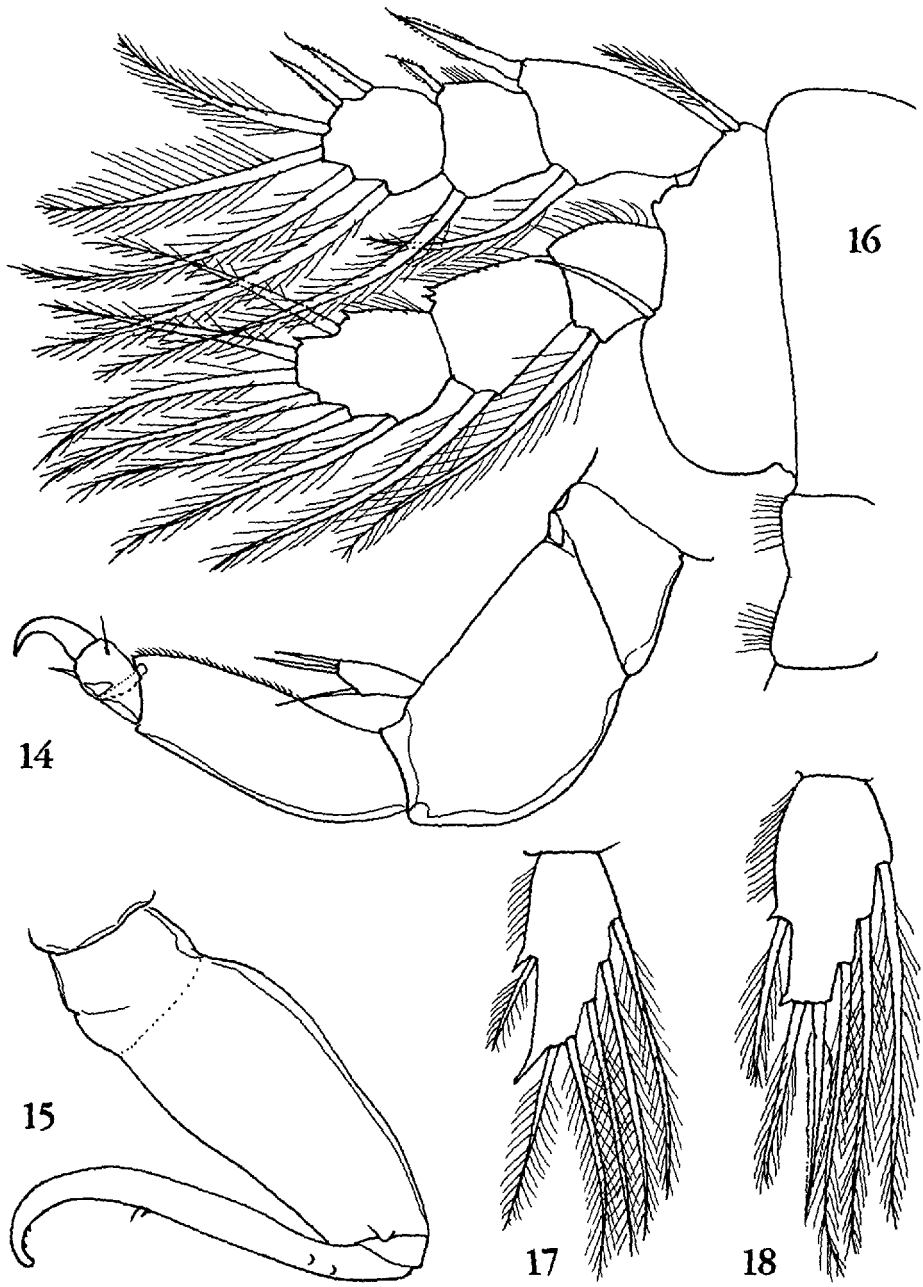
*Live Color.*—Female: First antennae purple-red. Cephalosome with two transverse, purple-red stripes above implantation of maxillipeds and first legs; also with two longitudinal stripes at each side, one pair over basis of 2nd antennae, one pair laterad of implantation of 1st legs. Purple-red stripes also at posterior margin of each metasomite. Urosome entirely purple-red. Eye bright to dark red. Eggs and ovaries dirty brown. Males and juveniles: paler, yellowish white to lavender-pink.

*Distribution.*—The western and central Caribbean Sea, with the eastern limits being southwestern Puerto Rico in the north and Curaçao in the south, and northern Gulf of Mexico (Texas Flower Garden Banks). *O. alatus* has specifically *not* been recorded with *D. antillarum* at Islas Verdas (off Vera Cruz, western Gulf of Mexico); the Florida Keys; Bimini and Nassau, Bahamas; St. George's Is., Bermuda; Nevis, Barbuda, St. Vincent and Barbados in the Lesser Antilles, Salvador (Bahia), Brazil; Barcelona, south of Punta Tacacas and Isla La Tortuga, Venezuela; and Santa Marta, Colombia (the last, being based on only a few specimens from one locality and at variance with the distribution otherwise documented, needs confirmation).

## Discussion

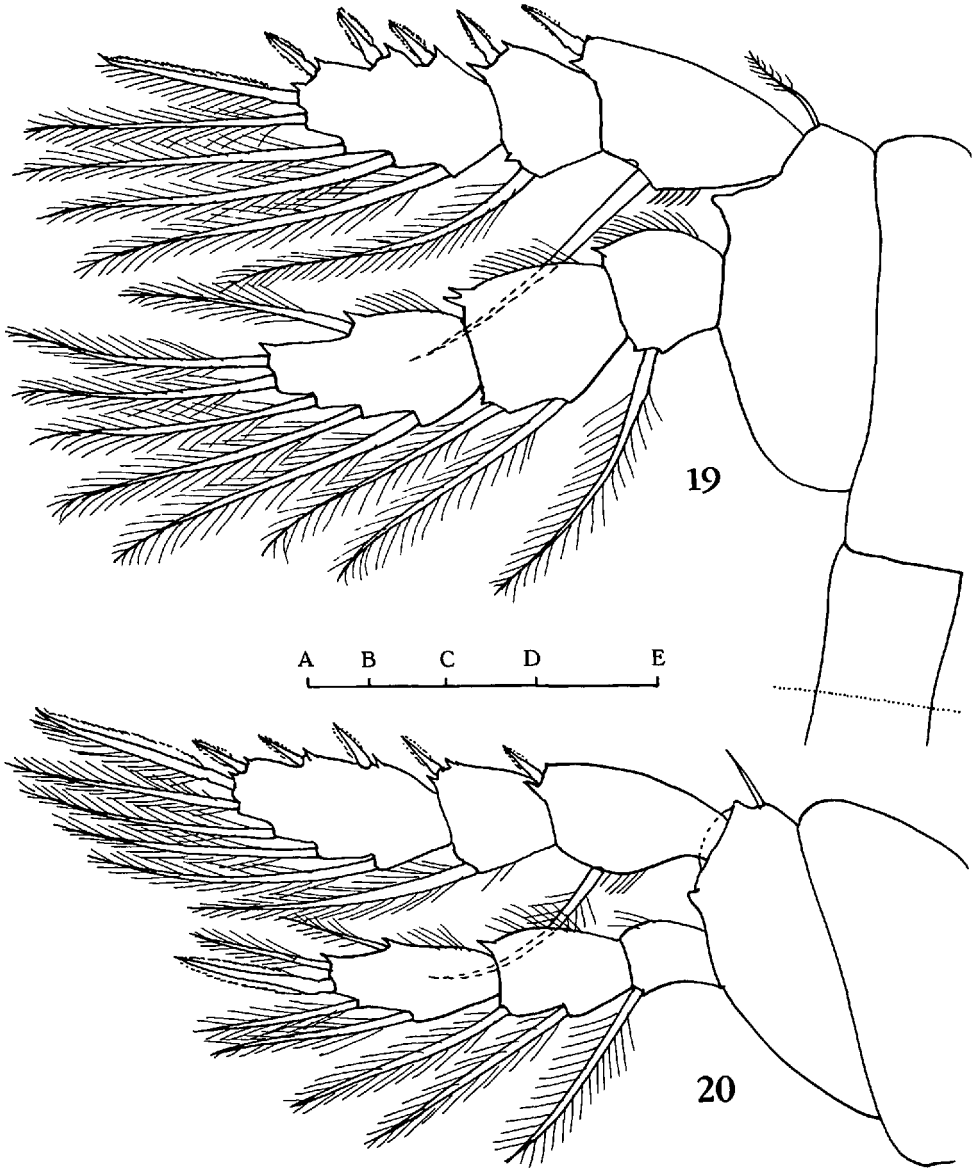
*Behavior.*—Miss L. L. Craft, while working on the association between the crab *Percnon gibbesi* (H. Milne Edw., 1853) and *D. antillarum* in south-western Puerto Rico (Craft, 1975), wrote to the junior author on 25 February 1972, about this copepod: "There seem to be two types: larger dark purple ones (often egg-bearing females) and smaller light lavender-pink ones. These latter are more numerous. When placed in a small container with *Diadema* spines, the copepods go to the spines (and) . . . orient parallel (to these) . . . but show no preference for direction. They spend much of the time moving from one end of the spine to the other and then back again. They also swim from the spines part of the time, particularly in response to light.

When I placed two of the copepods (1 light, 1 dark) on a living *Diadema,* I observed very much the same thing. They definitely live on the spines; I watched them over several hours and never saw them venture onto the test. They move up and down the spines (no preference for top or bottom) and *swim* between the spines; they do not reach adjacent spines via the test . . . . They sometimes remain in one position for several minutes, but are actively moving about much of the




Figures 14–18. *Onychocheres alatus* new genus, new species. 14, Second antenna, ♀ (scale AE); 15, second maxilla, ♀ (AD); 16, first leg, ♀ (AE); 17, endopodite segment 3 of second leg, ♂ (AE); 18, endopodite segment 3 of third leg, ♀ (AE). Each scale represents 100 μm. Scales on last figure.

time. The behavior seemed essentially the same for both copepods. My conclusion that these copepods live on the spines is further supported by the fact that I found so many in the filtrate from the bottom of the collection bucket before the urchins were treated in any way. Presumably they were on spines which were broken off in handling, since . . . they don't readily come off the urchin of their own accord."




Figures 19–20. *Onychocheres alatus* new genus, new species. 19, Second leg, ♀ (scale AE); 20, fourth leg, ♀ (AE). Each scale represents 100 μm.

*Host specificity.*—In Curaçao, *Diadema* occurs intermixed with three other species of sea urchins: *Tripneustes ventricosus* (Lam.) and *Echinometra lucunter* (L.) in more exposed sites, and *E. viridis* A. Ag. in more sheltered sites. In most other West Indian localities, these demarcations are not as rigid, but the same echinoids are involved. These three urchins have cyclopoid copepods as associates, but each has its own specific assemblage. As in the Pacific (Gooding, 1970) it is species of *Pseudanthessius* which are the usual occupants of the spines. *Onychocheres* has not been found on the other species of sea urchins.

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